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ILLINOIS RIVER BASIN RESERVOIRS. REPORT OF THE BENEFITS TO WATER SUPPLY AND POLLUTION ABATEMENT RESULTING FROM LOW FLOW AUGMENTATION FOR THE JUBILEE, LONDON MILLS, ST. MARY, MACKINAW DELLS, KENNY, OAKLEY AND TAYLORVILLE RESERVOIRS

Public Health Service
Chicago, Illinois

September 1959

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ILLINOIS RIVER BASIN RESERVOIRS

Report on the Benefits to Water Supply and Pollution Abatement Resulting from Low Flow Augmentation for the Jubilee, London Mills, St. Mary, Mackinaw Dells, Kenney, Oakley and Taylorville Reservoirs.

Prepared at the request of the
District Engineer, Chicago District
Corps of Engineers

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Bureau of State Services
Division of Water Supply and Pollution Control

Region V
Chicago, Illinois

September 1959

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PREFACE

In a study of this type, one is necessarily bound by the accepted engineering and economic practices of the day. As a result of these practices and of the assumptions imposed by Public Law 500, the conclusions of this study will perhaps seem harsh and final---this is not the intent.

Placing a value on present water supply benefits is difficult at best, and the prognostication of a value for these same benefits in 50 or 100 years is inconceivable. We should keep in mind that if these dams are built they will stand and be useful for more than 50 years. Yet, we are required to amortize an investment over a period of 50 years and to return interest after 10 years.

For purposes of Title III, analyses are made under the assumption that water supply developments will be financed wholly by the city. If it becomes a State or Federal policy to aid in the construction of such developments, water from a Corps of Engineers' Reservoir might become financially more attractive to the city.

With the above thoughts in mind this report is submitted, and although it is bound by accepted practices it is as liberal as possible in hopes that it will at least approach conditions of the future.

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INTRODUCTION

This report was initiated at the written request of the District Engineer, Corps of Engineers, Chicago, Illinois, in a letter dated August 14, 1959.

The Corps request relates to the "Memorandum of Agreement Between the Department of the Army and the Department of Health, Education, and Welfare to Provide Assistance in Implementing the Water Supply Act of 1958 (Title III, Public Law 500, 85th Congress)." Pertinent portions of the memorandum are:

"I-SURVEY AND REVIEW INVESTIGATIONS

> a. In carrying out any authorized survey, or review investigation, which may lead to construction of projects at which provisions for municipal or industrial water supply may be feasible and justified, the Corps of Engineers will consult with the Public Health Service to obtain the views and recommendations of that agency on present and prospective needs for such water supply and the desirability of meeting those needs from the project or projects under consideration. The Corps of Engineers will include in reports submitted to Congress, plans for the development of water supplies for municipal and industrial purposes and the views and recommendations of the Public Health Service.
>
> b. The Public Health Service will prepare and submit a report to the Corps of Engineers setting forth its findings and recommendations on each individual survey or review investigation involving improvements which may be useful and justified in developing water supplies. Upon completion of such survey or review investigation but prior to its submission to the Congress, the Chief of Engineers will furnish a copy of his proposed report to the Surgeon General, Public Health Service, for his review and comments in accordance with established Federal interagency procedures."

The authority to undertake this study stems from the Public Health Service Act of 1944 as amended, Public Law 410, 78th

Congress, and from the Federal Water Pollution Control Act, Public Law 660, 84th Congress.

Title III of the Rivers and Harbors and Flood Control Act of 1958, Public Law 500, 85th Congress, stipulates that storage may be included in reservoir projects of the Corps of Engineers or the Bureau of Reclamation for present or anticipated future municipal or industrial water supplies provided that state and local interest agree to pay all costs including interest. Payment may be delayed without incurrence of interest charges until initial use of the supply but the interest free period can not exceed ten years, and the total cost must be repaid within the life of the projects, which cannot exceed fifty years.

DESCRIPTION

The Illinois River watershed extends southwesterly across the northern half of Illinois from Chicago to the Mississippi River at Grafton, 38.7 miles above St. Louis, Missouri, northerly to just west of Milwaukee, Wisconsin, and easterly to South Bend, Indiana. About 40 percent of the State is drained by the Illinois River.

This report covers seven multipurpose reservoirs on tributaries entering the Illinois River between Peoria and a point a few miles below Beardstown. Three of the tributary watersheds, Kickapoo Creek, Spoon River, and La Moine River, are north of the Illinois, and the other two, Mackinaw and Sangamon Rivers, are south of it.

Valleys of the three northern tributaries are characterized by meandering streams bordered by long stretches of very flat land. Beyond the flat flood plains, the valleys ascent steeply to the uplands. The valleys of the southern tributaries are narrow with low, poorly defined sides that often merge with the flat bordering uplands. Interstream upland areas range from practically flat to gently undulating plains with a relief of 50 to 75 feet a mile. The bulk of the area is under cultivation devoted principally to grain-legume crop rotation.

Glaciation resulted in the complete burial of a well developed pre-glacial drainage system. Bedrock is revealed occasionally in valleys, often only on one side, where a high area of the pre-glacial bedrock topography is crossed.

The area is primarily agricultrual. Principal manufacturing centers are Decatur, Bloomington, Lincoln, Taylorville and Macomb. Other communities are centers of local trading in agricultural machinery and farm products. Mineral resources include coal, sand and gravel, limestone, and some oil and gas. Coal is produced in several areas but mining activities are being curtailed. As a result, most mining towns are losing population.

However, the population of the area appears to have stablized with larger communities experiencing a population rise counterbalanced by decrease in the smaller communities and in the rural areas.

Throughout the northern third of the Illinois River Basin, and along the main stem of the river, little use is made of streams for municipal water supply. Wells are the principal supply source. In other parts of the basin many municipalities, especially the larger cities, use streams or impoundments. Water supplies of Springfield, Bloomington and Decatur are obtained from reservoirs on tributary streams. Storage reservoirs vary considerably in capacity, the largest being Lakes Springfield and Decatur in the Sangamon River Basin and Lake Bloomington in the Mackinaw River Basin. Reservoirs of lesser capacity supply several small communities. Other small communities rely upon wells sunk in glacial drift, or sand and gravel deposits in stream beds.

PROCEDURE

Prior to reducing this report to writing, a number of preliminary steps were necessary. The first step was to determine those communities having a present or future municipal and industrial need which could reasonably be supplied from the proposed reservoirs. A list of communities within a 25 mile radius of the dam was prepared for each reservoir. The lists were reviewed by the Illinois Department of Public Health and the Illinois State Water Survey to pin-point municipalities having a possible present or future water supply need. Many municipalities were removed from the list because existing water supplies were considered adequate for present and future needs. Others were eliminated due to their proximity to the Illinois or Mississippi Rivers where adequate water is readily available. Still others were eliminated because of access to adequate ground water.

Data from various sources concerning the remaining municipalities were then collected and assembled. The principal data sources were records and publications of the State Department of Public Health, the State Water Survey and reports of the Corps of Engineers. Other sources included Bureau of the Census publications and consulting engineers reports. Reports prepared by consulting engineers proved extremely helpful, especially for evaluation of alternate water supply projects.

In estimating future populations to year 2010 it was assumed that larger communities would continue growth in accordance with

their past trends. For smaller communities, which generally have been losing population, it was assumed that the population would stabilize and remain at the present levels or increase only slightly.

In calculating future demands it was assumed that each community, whose estimated population will not reach 2,500 in the year 2010, would use 100 gallons per capita per day. Water use, in communities with populations 2,500 or more, was assumed to be 150 gallons per capita per day. Industrial water use was added to these figures.

The Corps' projects have a value equal to the cost of the most economical equivalent alternate supply, minus the cost of a water system utilizing the Corps' projects. In determining costs of alternate supplies, use was made of a number of sources.

1. "Reservoir Construction Cost in Illinois," Corps of Engineers.
2. "Data Book for Civil Engineers - Speifications and Costs," Elwyn E. Seelye.
3. Engineering News Record Cost Index for June 1958 (759.2).
4. Engineering News Record Index projected to the year 2000.
5. Engineering News Record unit costs.
6. Consulting Engineers Reports.

Construction costs were figured on the basis of June, 1958 cost values. Legal, engineering, administrative and contingency costs were estimated to comprise 25% of the project cost. Annual costs were determined on an annuity basis using a project life of 50 years at an interest rate of 4%. Annual power, operation and maintenance, and miscellaneous costs, where applicable, were added to the annuity for total annual costs.

A value for low flow augmentation for pollution abatement was fixed as the cost of a sewage treatment plant which would render an equal degree of purification.

Evaporation rates were secured from State Water Survey Bulletin No. 43, "1952-1955 Illinois Drought with Special Reference to Impounding Reservoir Design," Department of Registration and Education, State Water Survey Division.

Runoff, well yields, and sedimentation rates were obtained from "Atlas of Illinois Resources-Section 1, Water Resources and Climate," Department of Registration and Education, Division of Industrial Planning and Development.

Selection of alternate sites was accomplished by using topographic maps, State Water Bulletin No. 31 (Preliminary Data on Surface Water Resources), and consulting engineers reports.

The ground water sources considered as alternate supplies were assumed to require chlorination and possibly iron removal or other minimum treatment to produce a safe potable water. A higher degree of treatment, including filtration, was considered necessary for surface supplies.

ST. MARY RESERVOIR

The proposed Reservoir is located at mile 62.0 on the La Moine River. The dam would be located in Hancock County about a mile from the McDonouth County Line, and would be a rolled earth structure 8,900 feet in length and 83 feet in height with a 570 foot concrete spillway at elevation 545. Tainter gates on the spillway would bring the maximum pool elevation to 570 feet. Reservoir capacity at the top of the gates would be 296,400 acre-feet. Of this, 256,400 acre-feet would be allocated to flood control, 33,000 acre-feet to water supply and conservation, and 7,000 acre-feet to sediment.

Agriculture is the chief area occupation. Main agricultural endeavors include fattening livestock and growing cash and livestock grain. Industry is small and limited primarily to creamery and poultry processing companies. The area is expected to retain its rural character with very little or no industrial expansion.

The largest city within 25 miles of the reservoir is Macomb with a population of 10,592. Carthage and Rushville are the second and third largest cities with populations of 3,214 and 2,682, respectively. Remaining municipalities have populations of about one thousand or less. Macomb and Carthage have shown population increases since 1910, but the counties and most of the other municipalities have experienced population decreases.

Major water supply potentials are the Mississippi River, La Moine River, the East Fork of the La Moine River, and several large creeks. Alternate supplies evaluated in this report are on

Baptist Creek, the East Fork of the La Moine River, and the Mississippi flood plain.

Except in the flood plain of the Mississippi River, groundwater is not plentiful. However, small cities of less than one thousand population can meet their water supply needs from groundwater sources.

Since no large municipalities discharge sewage below the reservoir, water storage for low flow augmentation would not be needed for pollution abatement.

On the basis of consultation with the Illinois Department of Public Health and the Illinois State Water Survey, and an analysis of their records, only Carthage, Macomb, Blandinsville and La Harpe evidence water supply needs.

Carthage

The city obtains water from two wells capable of producing 200 gpm,[1] or 0.29 mgd,[2] and a reservoir. At the present time water is drawn from the lake only two hours a day except Sunday when it is used all day to provide soft water for Monday's wash.

The existing reservoir had a capacity of 130 mg[3] in 1937, but sedimentation reduced this to 110 mg by 1954. It is estimated that its capacity will be reduced to 84 mg by 1994 and 74 mg by the year 2010.

Water use in the city increased from 21 gpcd[4] in 1920 to 70 gpcd in 1952. This includes water used by a creamery and two poultry

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1/ gpm--gallons per minute
2/ mgd--million gallons per day
3/ mg--million gallons
4/ gpcd--gallons per capita per day

processing plants. An estimated 150 gpcd will be needed in 2010 to supply increased industrial and municipal use.

It is estimated that the population of the city will reach 7,500 in the year 2010. This population, using 150 gpcd, will need 1.13 mgd. The existing reservoir will not supply this amount for an eight month drought such as occured in 1953-1954.

The city engineer has determined that the existing reservoir can be enlarged to provide 294 mg in 1994 by raising the dam 10 feet at a cost of $264,000. Assuming the same sedimentation rate as in the past, the reservoir capacity will be 274 mg in 2010, which would supply the estimated water needs of the city for an 8 month drought period.

Alternate water supply sources are the Mississippi River or the City of Hamilton on the Mississippi River. The city engineer estimated the cost of developing either of these sources for 0.5 mgd to be about $408,000. This cost includes intake, pumping and transportation facilities. Facilities for 1.13 mgd would cost $720,000.

Inasmuch as Carthage is located midway between St. Mary Reservoir and the Mississippi River, a water transportation system from either of these sources would cost about $720,000. However, if Carthage used the St. Mary Reservoir, its proportionate cost of the reservoir would be added to this transportation cost.

Raising the existing dam 10 feet would supply adequate water for the city and would be the most economical water supply development. It is believed that Carthage will not be a potential water user of the St. Mary Reservoir during the next 50 years.

Macomb

The city is located on the East Fork of the La Moine River, about 14 miles northeast of the St. Mary Reservoir site. Western Illinois State College, pottery and porcelain companies, and two sheet metal products companies are situated in Macomb.

Macomb has had a fairly uniform population growth which is expected to climb from the present 10,592 to 17,000 in the year 2010. Water use increased from 40 gpcd in 1940 to 60 gpcd in 1955 including industrial use. The city's present use is 0.7 mgd. The total expected water use in 2010 is 150 gpcd which will amount to 2.55 mgd.

Macomb obtains water from a 150 mg reservoir on Spring Creek and a 2.5 mg channel dam reservoir on the East Fork of the La Moine River. The city's Spring Creek reservoir will be filled with sediment by 1980 and the channel dam reservoir is not a reliable source. The city would require 615 mg during an 8 month drought period in the year 2010.

Blandinsville

Blandinsville is located on Baptist Creek, about 11 miles north of the St. Mary Reservoir. The population decreased from 1,150 in 1910 to 920 in 1940 at which point it leveled off and remained constant till 1950. The city is expected to reach 1,000 in 50 years. Water use is also expected to increase from a present 40 gpcd to 100 gpcd in the year 2010, when the total water use will be 0.10 mgd.

The city now takes 0.04 mgd from a 26.8 mg reservoir and a channel dam reservoir on Little Creek, but these supplies are not adequate for future needs.

La Harpe

The city is located on the South Branch of Crooked Creek, about 13 miles north of the St. Mary Reservoir. La Harpe's population decreased from 1,349 in 1910 to 1,295 in 1950. Assuming that the population will stabilize after adequate water becomes available, the projected population for the year 2010 is 1,300.

La Harpe pumps water from the South Branch of Crooked Creek to its raw water reservoir. Present water use is 65,000 gpd of which 15,000 gpd is used by a creamery. Water use is estimated at 0.13 mgd for the year 2010.

Alternate Sources

To utilize the St. Mary Reservoir, Macomb, Blandinsville and La Harpe would have to construct transportation facilities.

Macomb could construct a 16" pipe line from the St. Mary Reservoir to the city for an annual cost of $131,000. This includes pumping costs but no reservoir costs.

Blandinsville and La Harpe could construct a common pipe line to the St. Mary Reservoir. This project would cost La Harpe $36,400 per year and Blandinsville $13,500 per year.

Alternate 1

Macomb, Blandinsville and La Harpe could construct a common reservoir on Baptist Creek near Blandinsville. This reservoir must have a capacity of 2,545 acre-feet to compensate for sedimentation and evaporation. Such a reservoir could be built for a total cost of $2,545,000. Based on the proportionate amount of water used by each

city, Macomb's share of the reservoir cost would be $2,336,000. Blandinsville and La Harpe would pay $92,000 and $117,000, respectively, for their share of the reservoir.

For use of this reservoir Macomb would have to lay a 16" pipe line 8 miles long. Macomb's total annual cost of this alternate, including reservoir, pipe line, and pumpage, would be $178,000.

Blandinsville would have to transport water about one mile from this reservoir. The total annual cost of reservoir, pipe line, and pumpage, would be $7,400 for Blandinsville.

La Harpe must lay 6 1/2 miles of 6" pipe in order to utilize this reservoir. The total annual project cost for La Harpe would be $22,500, including reservoir pipe line and pumpage.

Alternate 2

Macomb could construct a reservoir on the East Fork of the La Moine River ten miles below the city for a cost of $2,400,000. Ten miles of 16" pipe from this reservoir to the city would cost $1,110,000. The total annual cost for this alternate would be $209,000 including reservoir, pipe line and pumpage.

Alternate 3

La Harpe could lay a pipe line 10 miles northwest to wells drilled in the Mississippi River flood plain and obtain abundant water at an annual cost of $25,000. This water would only need chlorination.

SUMMARY

ST. MARY RESERVOIR

1. Macomb can secure 2.55 mgd from a reservoir on Baptist Creek for an annual cost of $178,000 or from a reservoir on the East Fork of the La Moine River for an annual cost of $209,000. The annual cost of transporting water from the St. Mary Reservoir would be $131,000. Water from the Corps of Engineers' project at St. Mary has an annual value of $46,900 for Macomb.
2. Blandinsville can secure 0.10 mgd from a reservoir on Baptist Creek for an annual cost of $7,400. The annual cost of transporting water from the St. Mary Reservoir would be $13,500. Water storage in the Corps of Engineers' project at St. Mary has no economic value for Blandinsville.
3. La Harpe can secure 0.13 mgd from a reservoir on Baptist Creek for an annual cost of $22,500. The annual cost of transporting water from St. Mary Reservoir would be $36,400. Water storage in the Corps of Engineers' project at St. Mary has no economic value for La Harpe.
4. Carthage can raise its existing dam and develop an adequate water supply for less than 60 percent of the cost of a transmission line to the St. Mary Reservoir.
5. Water storage in the St. Mary Reservoir for low flow augmentation would have no value for pollution abatement.

OAKLEY RESERVOIR

The proposed Oakley Dam is located on the Sangamon River, approximately five miles north of Decatur, and would be 3,500 feet long and 55 feet high. The total volume of the reservoir, as presently proposed for all purposes, would be 148,000 acre-feet with 11,000 acre-feet allocated for water supply and 4,500 acre-feet for sediment. The lake formed by the conservation-sediment pool would be 2,400 acres, with an average depth of approximately 5 feet excluding the sediment pool. During a seven month maximum demand period and a simultaneous 100 year drought, the yield of the Oakley Reservoir would be 12.2 mgd for water supply purposes. This yield is based on the assumption that Lake Decatur will continue to be credited with all runoff from the watershed.

Areas around Oakley are rich farm land, producing abundant soybean, corn and wheat crops as well as other crops in smaller quantities. Except for Decatur, communities within the area are predominately rural in character. The largest municipalities within 25 miles of the dam and their respective populations are: Decatur (66,269), Monticello (2,612), Bement (1,459), Lovington (1,152), Maroa (1,100), and Cerro Gordo (1,052). There appear to be no outstanding features in the smaller towns indicative of future industrial growth. Some small population growth may occur as a result of industrial workers from Decatur settling in suburban towns, but such increase is expected to be negligible. In general, it may be said that no significant increase in water use is probable within this area, again, excepting Decatur and its urban area, and future

demands can be met from existing sources.

Decatur

Decatur is located on both sides of the Sangamon River, approximately 5 miles southwest of the proposed Oakley Dam site. It is the only industrial center in the Oakley Project area. Until World War II, the major manufacturing activity centered around the processing of agricultural products supplied from the surrounding counties. There were also railroad shops and metal products firms, two of which, Wagner Malleable Iron and Mueller Company, are leaders in their respective fields. During and after the War period, several large manufacturers of metal products moved into the City, employing approximately 11,000, or about 25% of the present labor force. The largest new industry in this field is the Caterpillar Tractor Company with 3,200 employees.

Decatur has had a continual growth since 1860. The population increased from 3,839 in that year to an estimated 77,000 in 1957. This increase occurred in two ways: (1) new people moving into the city proper and (2) annexation of areas into the city limits. It is expected that annexation will continue until the city approximates the present urban area. It is anticipated that water needs will be supplied through Decatur's present system and forecasts are made in this light. The 1957 population of this urban area, which includes all of Decatur Township and parts of adjacent townships, was 86,400.

The growth potential of the Decatur urban area is high. It is located approximately midway between Chicago and St. Louis. It is the trading center for an agricultural area of approximately 7,000

square miles, which provides a large market for manufacturing, commercial and service establishments. The larger industries, such as Caterpillar Tractor, A. E. Staley, Borg-Warner, Pittsburgh Plate Glass, General Electric, Mueller, Wagner and Decatur Pump, serve national and international markets.

Transportation facilities are very good. Decatur is served by five railroads - the Wabash, Illinois Central, Baltimore and Ohio, Pennsylvania and Illinois Terminal. The Wabash and Illinois Central Railroads maintain yards and shops in Decatur. Two Federal and four State highways intersect in Decatur providing excellent highway connections. Improvements are currently underway or planned for several of these highways which will further enhance their value. Ozark Airlines operate 12 flights daily connecting Decatur with Chicago, St. Louis, Kansas City, Indianapolis and several other large cities.

Raw materials, for industry processing agricultural products, are available in the immediate area. Decatur is the center of the soybean industry in the United States. Corn and soybean products account for some 35% of earnings from manufactured goods sold outside the immediate area. The A. E. Staley Co., largest of this industrial group, employs some 3,000 people.

Raw materials for the metals industry, which are primarily fabrication plants, are available from the large steel mills in the Chicago area.

Electric power is supplied by the Illinois Power Company which also distributes natural gas from the Pandhandle Eastern Pipe Line Co. Coal and oil deposits are located throughout several nearby counties.

The labor supply for the Decatur area is drawn from a radius of about 30 miles. There is a tight labor market in Decatur itself; latest unemployment figures indicate less than 2,000 unemployed out of a total labor force of 48,000 people. However, south of Decatur mechanization and abandonment of coal mines has resulted in considerable unemployment. Decatur's industries have absorbed many of these workers and others will, in all likelihood, augment Decatur's manpower in the future. Additional labor will undoubtedly be attracted from other areas, either commuting or moving into the city.

In addition to the direct factors affecting the influx of industry, such as transportation, labor, markets, fuel and power, there are many other factors. For example, Decatur is the home of Milliken University which has facilities for about 1,000 full-time students, and offers adult education programs. The public school system is reported to be good. About 11 percent of the city's total area is devoted to parks and recreational areas, in addition to the recreational development at Lake Decatur. The city has a full-time planning commission and an effective zoning program which is providing for a city of 200,000 people. Public projects are being developed at a rate twice that of the U. S. average.

The firms, now located in Decatur, do not anticipate large expansions in the forseeable future, with the exception of Spencer Kellogg which is planning a new oil refinery. Normal expansion at a rate approximating that in the past is predicted for these firms. Development of new industry is anticipated, generally in the construction and automotive fields. Commercial and service establishments are expected to increase in proportion to population growth.

The Decatur area is expected to maintain approximately the same population growth rate as previously experienced. Population to be served with water in the year 2010 is estimated at 130,000 people.

Total water usage from city mains in 1957 was 10 mgd for the average day, with approximately 35 industrial and other large users accounting for 4.5 mgd. Maximum daily use has reached 19 mgd. The average domestic and commercial use is 75 gpcd.

TABLE I

Average Daily Water Use by Major Water Users in Decatur, Illinois.

Consumer	Latest Available Consumption (mgd)
Archer-Daniels-Midland[1/]	1.00
Baltimore and Ohio Railroad	.01
Borg-Warner	.50
Citizen's Building	.03
Chambers-Bering-Quinlan Co.	.09
Caterpillar Co.	1.00
Checkerboard Soybean Co.	.08
Decatur Milling	.05
Decatur High Schools	.03
Decatur and Macon County Hospital	.01
Empress Theatre	.02
General Electric	.2
Grigoleit Co.	.13
Houdaille Hersey, Decatur Division	1.12
Illinois Central Railroad	.05
Illinois Power Co.	.09
Lincoln Theatre	.03
Meadow Gold Dairy	.11
Mueller Co.	.22
Milliken University	.04
Normans Laundry	.06
Orlando Hotel	.03
Schudel Laundry	.04
Soft Water Service	.03
Spencer Kellogg	.26
Signal Depot	.12
Staley Co.[2/]	.59
Staley Co.[1/]	4.00
Standard Office Building	.01
St. Mary's Hospital	.01
St. Nicolas Hotel	.03

Consumer	Latest Available Consumption (mgd)
Sunshine Dairy	.03
Wagner Malleable Iron	.39
Wabash Railroad	.45
Wabash Industrial Tract	.16
Total	10.95 3/

In addition to those using the city system, there are several self or partially self-supplied users. These are the Staley Co. and Archer-Daniels-Midland Co. who take water from Lake Decatur, and several small ice companies and dairies who are supplied from individual wells.

The two companies supplied from Lake Decatur use and average of 15 mgd. About 11 mgd is cooling water which is returned to the Lake. The remaining self-supplied users have wells producing from 30 to 125 gpm. The quality of the ground supply varies, but in general has a high iron content and is hard. However, the users of well supplies do not contemplate switching their source of supply nor do they contemplate extensive expansion. Their existing supplies are adequate for present and future needs.

Per capita use is anticipated to reach 150 gpd in the year 2010, for domestic and commercial use, due to an expected increase in the number of water consuming devices both in the home and in commercial establishments. The total domestic and commercial use in 2010 is

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1/ Self-supplied from Lake Decatur.
2/ Portion of Staley Co. usage supplied by City.
3/ Total minus self-supplied industries does not equal figure of 4.5 mgd since consumption data are from different years.

estimated at 20 mgd.

Industrial water use is expected to increase at a rate similar to that experienced in the past with increased use by existing and new industry, tempered by conservation practices, and decreased use by the railroads. Future industrial demands for the year 2010 are estimated at 18 mgd including an estimated 7.0 mgd for Staley and Archer-Daniels-Midland over and above cooling water requirements.

Total municipal and industrial water use for the Decatur area in 2010 is estimated at 38 mgd average.

The principle source of the present water supply is Lake Decatur, constructed in 1922 on the Sangamon River just south of Decatur. In 1952, the Advisory Committee for Preservation of Lake Decatur and for Additional Water Supplies reported that "siltation and increased uses have created a serious and immediate threat to the water supply." This "forecast" was realized during the severe drought of 1953-54 when, due to a reduction in capacity from siltation and greatly increased water demands, the inadequacy of Lake Decatur was shown. The Committee proposed a plan of long range development of water sources which included the Oakley site - either in conjunction with the Corps of Engineers or by the city itself.

After the drought experience, two stopgap measures were undertaken to provide water until new sources could be developed. Bascule gates were installed in 1955 on the original Lake Decatur Dam to provide approximately 16,000 acre-feet of additional storage, and two wells, with a capacity of 5 mgd, were developed in the underground Mahomet Valley, 12-14 miles north of the city. Water from

these wells is pumped into Sangamon River and flows into Lake Decatur.

The quality of the present supply is good. There is little pollution, and, although the reservoir was relatively shallow until the gate installation, few algae problems have been encountered. Treatment consists of softening, sedimentation, filtration, recarbonation and chlorination. The treatment plant capacity was recently increased from 14 to 26 mgd.

The critical drought period for Decatur, as determined by the city's consulting engineer, based on the 100 year minimum runoff and the maximum demand, is approximately seven months. The net storage necessary to carry over this period at present rates of use is approximately 4.5 billion gallons. The net yield of the present Lake Decatur is about 5.4 billion gallons including seven months runoff. With siltation progressing at a rate of about 1.2% per year, and increasing use, the present source is estimated to be adequate until 1965.

Ground water is located in scattered lenses throughout the area, however, it is felt that neither quality nor quantity recommend it as a feasible alternate to surface water for the city's supply.

Lake capacity in the year 2010 is somewhat variable depending upon the future sources developed. Construction of the Oakley project will reduce siltation in Lake Decatur approximately 70% but will also reduce the gross capacity by about 4,000 acre-feet since the Oakley site is downstream of the present backwater limit. Other alternate sources effect Lake Decatur's yield similarly but to varying degrees. The seven month yield under various alternate water supply plans is included in Table II.

TABLE II

Alternate Water Supplies

Source	Yield 1/ (mgd)	Estimated Year of Inadequacy	Initial Cost 2/ (mil. $)
Alternate 1:			
Present Lake Decatur	19.4	1965	--
Oakley by Corps of Engineers as presently proposed	12.2	1985	--
Big Creek (Stage 1) 3/	17.1	after 2010	$ 4.8
	48.7		
Alternate 2:			
Present Lake Decatur	19.3	1965	--
Oakley by Corps of Engineers with increased capacity	26.2	after 2010	--
	45.5		
Alternate 3:			
Present Lake Decatur	17.8	1965	--
Oakley by City (Stage 1) 4/	17.7	1980	$ 7.8
Oakley by City (Stage 2) 4/		2000	.7
Friends Creek	13.1	after 2010	2.7
	48.6		$11.2
Alternate 4:			
Present Lake Decatur	18.9	1965	--
Oakley by City (Stage 1) 4/	1.8	1980	$ 7.8
Big Creek (Stage 1) 3/	23.7	2000	5.3
Big Creek (Stage 2) 3/		after 2010	.2
	44.4		$13.3
Alternate 5:			
Present Lake Decatur	13.0	1965	--
Big Creek (Stage 1) 3/	22.6	1985	$ 6.5
Big Creek (Stage 2) 3/		1995	.3
Oakley by City (Stage 1) 4/	8.8	after 2010	4.6
	44.4		$11.4

1/ Estimated yield in mgd produced in the year 2010 over a seven month period.

2/ Initial cost in 1958 dollars based on a projected ENR Construction Cost Index and returned to 1958 value at a 4% rate of interest.

3/ Big Creek (Stage 1) consists of a pool 1,170 acres in area with a gross storage of 14,200 acre-feet. Stage 2 denotes the same structure increased in height by the

addition of five foot gates increasing the lake area to 1,520 acres and the gross storage to 21,000 acre-feet.

4/ The design of Oakley Dam, as proposed by the city's consultants, consists of a first structure forming a pool with an area of 2,400 acres and a gross storage of 15,000 acre-feet which is designated at Stage 1. Stage 2 entails increasing the height of the structure five feet by means of gates, thus providing a lake with an area of 3,500 acres and a gross storage of 30,000 acre-feet.

All of the above alternate sources are located on the watershed which supplies Lake Decatur; therefore, all water is of equal quality. All sources discharge directly into Lake Decatur, eliminating need for transmission lines and pumping. Since all alternate plans have a similar source, quality, and method of delivery to the point of treatment, Alternate 3 was selected, on the basis of initial cost, as the most economical water plan for the purpose of evaluating the Corps of Engineers' project which is included as a part of Alternate 1 and Alternate 2.

The annual cost of Alternate 3 is $630,000 including maintenance and operating costs.

The value of water supply storage in the Corps of Engineers proposed Oakley project is $357,000 per year.

However, if the Corps of Engineers provide storage capable of supplying 26.2 mgd over the seven month critical period or 17,100 acre-feet of net storage (after evaporation and seepage losses), this storage would be worth $630,000 per year.

The Decatur Sanitary District sewage treatment plant is the only large plant releasing effluent downstream of the proposed Oakley Dam. Since all runoff in the Sangamon River, upstream from this point, is needed for water supply during period of low flow,

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there will be no water available for low flow augmentation. Therefore, no value may be assigned to storage in the Oakley Reservoir for pollution abatement.

SUMMARY

OAKLEY RESERVOIR

1. Decatur is the only municipality in the Oakley Reservoir area which would have an economically justified need for this reservoir. Its needs are estimated at 38 mgd average yearly or 45.5 mgd average over a critical seven month period of maximum consumption and minimum runoff in the year 2010.
2. The Corps of Engineers' proposed Oakley project would provide 12.2 mgd which is sufficient water to supplement Decatur's municipally-owned supply and meet its maximum demands until 1985. This project would have a value of $357,000 per year.
3. A larger water supply storage in the Corps of Engineers' project at the Oakley site, capable of supplying 26.2 mgd for the seven month critical period, would provide sufficient water to supplement Decatur's municipally-owned supply until 2010 and would have a value of $630,000 per year.
4. There is no storage available for a pollution abatement benefit.

TAYLORVILLE RESERVOIR

The proposed Taylorville dam and reservoir would be located at mile 3.3 on Flat Branch of the South Fork of the Sangamon River. The dam would consist of a rolled-earth structure, with a length of 6,300 feet and a maximum height of 55 feet. The top of the dam would be at El. 619. The reservoir would have a total capacity of 109,000 acre-feet at the spillway crest (El. 605.0). A permanent conservation-sediment pool of 15,900 acre-feet with a surface area of 2,400 acres would be provided for water supply and recreation, with 7,200 acre-feet allocated to water supply, yielding four mgd during an 18 month drought.

The municipalities within 25 miles of the dam, considered by the State Department of Public Health and the State Water Survey to have possible water supply needs, as well as those which had expressed a desire for water from the Taylorville Reservoir, are listed below with their populations.

Municipality	1950 Census Population
Taylorville	9,188
Pana	6,178
Kincaid-Bulpitt	1,169
Jeiseyville	199
Tovey	593
Morrisonville	1,182
Stonington	1,120
Nokomis-Coalton	2,946
Assumption	1,466
Moweaqua	1,475
Edinburg	921
Palmer	335

Based on the information provided by the State agencies, the remainder of the municipalities, within the 25 mile radius, are

considered to have sufficient water for all foreseeable future needs.

Taylorville

Taylorville is located on the South Fork of the Sangamon River, approximately one mile downstream of its confluence with Flat Branch, and approximately three miles downstream from the proposed Taylorville Dam.

Taylorville is predominantly a trade center for the surrounding agricultural area. Industrial activities include: processing soybeans and other agricultural and dairy products; poultry hatching and packing; coal mining; railroad equipment maintenance; paper manufacturing; and the manufacture of electrical tools, greeting cards, agricultural implements and garment pressing equipment. Employment in the coal mining industry is decreasing rapidly due to the closing of several mines and mechanization of the remaining ones.

There is a large available labor force in the immediate area to the south and west, created, in part, by unemployment in the coal industry. Transportation facilities include three railroads, and three paved highways. The Wabash main line between St. Louis and Chicago passes through Taylorville providing direct service to those cities.

It is thought that a small, steadily increasing, industrial growth of medium size firms (employing 100-300 persons) will take place over the next 50 years.

The population has shown a continual growth, increasing from 5,446 in 1910 to 9,199 in 1950. Population growth is expected to continue at a rate similar to past trends, reaching 16,000 in the year 2010.

Per capita water use in 1955 was 77 gpd from the city's system. It is expected that per capita use, including domestic, commercial and small industrial users, will increase to 150 gpd in 2010. Total water use in 1955 was 819,000 gallons per day from the city system and 1.33 mgd by Allied Mills and Hopper Paper Co., self-supplied industries. Total use, including self-supplied industries, is estimated at 5.6 mgd in 2010. The two self-supplied industries will probably be supplied by Taylorville in the future.

Taylorville's present source of supply consists of several wells. Latest available information indicates that the four wells in use produced 4.5 mgd when drilled in 1951. Since that time, however, production has been decreasing steadily, due to a lowering of the water table at rates of 3.2 to 5.3 feet per year. At the present rate of pumpage and water table recession, these wells will be dry before 1971. Wells supplying Allied Mills and Hopper Paper Co. are undergoing the same general decline.

The history of ground water development in the Taylorville area has followed a similar pattern. Initial well production was adequate, followed by a gradual reduction of capacity, and then abandonment. An extensive, unsuccessful resistivity study was made in 1930 in an attempt to locate ground water sources capable of supplying a 10 mgd industrial demand and an 0.8 mgd domestic and commercial demand. It is, therefore, considered that local ground water sources are not suitable as an alternate supply for a city of the predicted size of Taylorville. For this report the existing wells will be considered only as a supplementary source to be used during periods of high water demand.

A surface water supply is currently under development by Taylorville on the South Fork of the Sangamon River, upstream from its junction with Flat Branch. A bond issue has been approved and about 70% of the necessary land purchased or optioned. It is assumed that development of this site will be completed. The initial reservoir will have a storage of 1,810 mg or 5,540 acre-feet and an area of 870 acres at El. 585. The dam is designed so it can be raised 5 feet, thereby providing for a future increase in storage to 3,745 mg or 11,150 acre-feet with an area of 1,300 acres. The estimated yield from the initial stage of development is 2.1 mgd. This will supply adequate water until 1980-85, when an additional source, capable of supplying 3.5 mgd in 2010, will be necessary. This additional water could be obtained from the proposed Corps of Engineers' Taylorville Reservoir or by raising the city dam five feet. Raising the dam will yield an estimated 6.3 mgd in 2010.

	Net Yield or Use in 2010 (mgd)	Year of Need	Initial Cost (1958 dollars)
Alternate 1:			
South Fork Res. by City	2.1	present	$1,770,000
Taylorville Res. by Corps of Engrs.	3.5	1980	
	5.6		
Alternate 2:			
South Fork Res. by City	2.1	present	$1,770,000
Raise South Fork Res. 5. ft.	4.2 increase	1980	1,090,000
	6.3		$2,860,000

Both alternates are approximately equal as to quality, treatment and distance from point of use.

The value of water supply storage in the Corps of Engineers' Taylorville Reservoir capable of supplying 3.5 mgd to the city of Taylorville is $51,000 per year, based on the cost of Alternate 2.

Taylorville is the only large city discharging sewage below the proposed Taylorville Dam. The construction of reservoirs on both Flat Branch and South Fork immediately upstream of their confluence will reduce streamflow to almost nothing at the outfall during drought periods. Since there is 0.5 mgd available from the Taylorville Reservoir over and above Taylorville's projected water needs, there would be a benefit of $1,500 per year for pollution abatement if the 0.5 mgd would be released for low flow augmentation.

Pana

Pana is located 14 miles southeast of the Taylorville Reservoir, in the extreme corner of Christian County. Its industries consist of a small refinery operated by a farmers' Cooperative Association, the Sugar Creek and Equity Union Creameries, several wholesale florists, and the Peabody Coal Co. No large industrial growth is expected.

Population increased from 5,077 in 1890 to 6,178 in 1950. Future growth is anticipated to continue at a fairly uniform rate, reaching 8,000 in 2010.

Industrial water use in 1955 averaged 709,400 gpd and domestic use 791,000 gpd, for a total of 1.5 mgd. Domestic use on a per capita basis was almost 130 gpd. The city's consulting engineers think this

figure represents considerable leakage and could be reduced substantially. Domestic use in the year 2010 is estimated at 150 gpcd or 1.2 mgd and industrial use at 1.0 mgd, making a total water use of 2.2 mgd.

The present source of supply is a lake on Beck's Creek. The gross capacity of this reservoir in 2010 is estimated at 2,450 acre-feet with a surface area of 218 acres. However, the watershed of only 8.4 square miles yields little runoff. The estimated minimum yield from this reservoir occurs over an 18 month drought period and is 1.4 mgd in 2010. With an average demand of 2.2 mgd, an additional source capable of yielding 0.8 mgd in 2010 will be necessary. There are no favorable surface water sites in the vicinity of Pana.

Ground water in the immediate vicinity of Pana is rare, with wells producing 10 gpm or less. A large aquifer, capable of producing over 500 gpm per well, is located about 14 miles to the east of Pana near the Kaskaskia River. It appears that this is the only feasible alternate to the Taylorville Reservoir.

The two sources capable of supplying 0.8 mgd are:

1. Taylorville Reservoir
2. Ground water source located 14 miles east of Pana.

These two sources are located at equal distances from the city, therefore transmission and pumping requirements are approximately equal. The quality of ground water is such that treatment would consist of chlorination and possibly iron removal. Reservoir water would require complete treatment. The city presently has a filter plant for its surface supply, but its capacity is insufficient for 2010 demands.

Initial and annual costs for the alternate sources of water supply are:

	Initial Cost	Annual Cost
Taylorville Reservoir*	$1,508,000	$101,000
Ground Water Supply	$1,219,000	$ 86,500

*Cost of the water system less impoundment in the Taylorville Reservoir.

The cost of developing either source is approximately the same, excluding the cost of impoundment in the Taylorville Reservoir. Therefore, water supply storage in the Corps of Engineers' reservoir is not economically justified for Pana.

Kincaid-Bulpitt-Tovey-Jeiseyville

Bulpitt, Tovey, and Jeiseyville are located within two miles of Kincaid, which is located approximately 11 miles northeast of the proposed Taylorville Dam. Bulpitt is served by Kincaid. Tovey and Jeiseyville do not have municipal supplies, but they would be served by Kincaid.

The combined 1960 population of the four towns was 1,961. Bulpitt and Kincaid have had a slow, steady population growth over the past 30 years. Tovey and Jeiseyville lost almost 40% of their population between 1930 and 1950, dropping from 1,263 to 792. Estimated total population of the four towns in 2010 is 3,300. There is no major industrial expansion expected, either by existing industries or by new industry. However, a slow, steady industrial growth similar to that experienced in the past is expected.

Present water use of Kincaid and Bulpitt is about 160,000 gpd

or 80 gpcd. Total water use for the four towns in 2010, based on a per capita use of 150 gpd, is estimated at 500,000 gpd.

The present supply for Kincaid-Bulpitt consists of an 89 mg reservoir on a tributary of the Sangamon River. This supply proved inadequate during the drought of 1953-54. It is estimated that the reservoir will be completely filled with silt by 2010. Therefore, a source capable of supplying the entire 500,000 gpd will be necessary by that time. This water could be supplied by one of the following three reservoirs:

Taylorville Reservoir

Alternate 1: Reservoir on Clear Creek.

Alternate 2: Ground water from the floodplain along the South Fork of the Sangamon River.

The two reservoirs are similar as to quality, therefore, treatment costs would be similar. Taylorville Reservoir would require about ten miles more transmission line with resulting higher pumping costs than Alternate 1.

Alternate 2 requires less transmission costs than the Taylorville Reservoir but slightly more than Alternate 1. Treatment costs will be considerably less for Alternate 2 than for either of the other sources.

Initial and Annual Costs for Alternate Sources of Supply

	Initial Cost	Annual Cost
Taylorville Reservoir*	$ 853,000	$ 61,000
Alternate 1	$2,550,000	$152,000
Alternate 2	$ 271,000	$ 31,000

*Includes all costs except direct cost of storage in the Corps of Engineers' reservoir.

The storage of water in the Corps of Engineers' Taylorville Reservoir is not economically justified for Kincaid, Bulpitt, Tovey and Jeiseyville.

Nokomis-Coalton

Nokomis serves Coalton, and both are located 17 miles southwest of the Taylorville Reservoir.

The population of Nokomis increased by only 90 persons between 1930 and 1950 to a total of 2,544. Coalton has decreased steadily from 611 in 1930 to 402 in 1950. Major activities in the area are coal mining and agriculture. Past industrial growth has been slow and no extensive development is anticipated. The 2010 population of Nokomis-Coalton is estimated at 3,400 people.

Present city water use averages 122,000 gpd or 45 gallons per person. Per capita use in 2010 is estimated at 150 gpd, making a total use of 510,000 gpd.

The present source of supply consists of six wells with a maximum production of 540 gpm or 778,000 gpd. Total use, from the ground water source, by self-supplied users and the city is presently between two and three million gallons per day. This withdrawal has not decreased well yields to any noticeable extent. It is believed that Nokomis-Coalton will have sufficient water through 2010 and will not benefit from storage in the Taylorville Reservoir.

Assumption

Assumption is located approximately 13 miles east of the Taylorville Dam. The town is predominantly rural in character and possesses little industry. Future development of large industries is improbable. The population decreased from 1,918 in 1910 to 1,466

in 1950. Estimates indicate a slight increase to 1,600 in 1959. The population is expected to reach 1,800 in the year 2010.

Per capita use is 72 gpd at the present time and is expected to increase to 100 gpd by 2010, making a total demand in that year of 180,000 gpd.

The present source of supply consists of four dug wells and two driven wells. The water is hard and is treated by aeration, sedimentation, filtration, softening, chlorination and fluoridation. Production from all wells is 216,000 gpd. This is sufficient to meet all estimated future demands unless production decreases. In that event, there are other ground water areas within two or three miles of the town. Production, in the general area, is between 20 and 100 gpm per well. It appears fairly certain that the present source can be augmented by new wells at a more economical cost than obtaining water from the Taylorville Reservoir.

It is believed that Assumption will not need storage in the Taylorville Reservoir.

Moweaqua

Moweaqua, located 13 miles northeast of the Taylorville Dam, is primarily a trading center for the surrounding area. No extensive industrial development is expected. The 1950 population was 1475. The population has been fairly stable since 1900, varying slightly above and below 1,500. Estimated 2010 population is 1,600.

Water use in 1956 was 0.1 mgd, with a per capita use of 65 gpd. Per capita use is expected to increase to 100 gpd, producing an estimated water use of 160,000 gpd in 2010.

Water is presently secured from three wells located two miles north of the city. Production is 150 gpm or 216,000 gpd, which will be sufficient through 2010. In addition to these wells, the city has six old wells which will produce in excess of 144,000 gpd, and more water is available in the area of the present wells.

It is believed that Moweaqua will have sufficient water for 2010 without storage in the Taylorville Reservoir.

Morrisonville

Morrisonville is located 14 miles southwest of the Taylorville Dam. It has no large industry but serves as a center for the surrounding agricultural area. Past trends indicate that it has reached a population equilibrium. The 1950 population was 1,182 and the 2010 population is estimated at 1,400.

Water use is presently 50,000 gpd with a per capita use of about 45 gpd. An estimated per capita use of 100 gpd in 2010 will produce a total demand in that year of 140,000 gpd.

The present source of supply consists of two drift wells, located 50 feet from the bank of Bear Creek, which produce a total of 300 gpm or 432,000 gpd. A spring well, producing 144,000 gpd, is used as an emergency source.

Morrisonville will not need water from the Taylorville Reservoir as its present sources should be adequate through the year 2010.

Palmer

Palmer is located approximately 11 miles southeast of the Taylorville Dam. It is primarily a rural community with a 1950 population of 335. Estimated 2010 population for this community is

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approximately 800 people. At present there is no municipal water supply. Assuming the construction of such a system, a per capita use of 100 gpd or a total use of 80,000 gpd would be expected in 2010. Water could most economically be obtained by going three miles to Morrisonville. Morrisonville's present supply is capable of supplying both municipalities through 2010.

It is not economically justified for Palmer to obtain water from the Taylorville Reservoir.

Stonington

Stonington is a rural community located six miles northeast of the Taylorville Reservoir. The population has been fairly constant at about 1,100 since 1920. The 1950 population was 1,120. Only a small increase is considered probable, and the 2010 population is estimated at 1,400.

Average water use in 1959 was 100,000 gpd which is about 85 gpcd. Total water use in 2010 is estimated at 140,000 gpd, based on a per capita consumption of 100 gpd.

The present source, consisting of seven wells, is capable of producing over 300,000 gpd. Six of the wells now produce 288,000 gpd, and improvements to the pumping equipment could increase this to 525,000 gpd. The seventh well was drilled in 1959 and production figures are unavailable. However, based on the other six wells, it should produce a minimum of 30 gpm. The present well supply is capable of yielding 570,000 gpd which will be more than ample for anticipated uses. Therefore, Stonington will not need water supply storage in Taylorville Reservoir.

Edinburg

Edinburg is located 10 miles northwest of the Taylorville Dam. There is no large industry and no large future development is forseen. The population has been fairly constant at about 900 since 1910. The 1950 population was 921 and the estimated 2010 population is 1,000.

Per capita use is presently about 45 gpd. Total average use is 41,400 gpd. An increase in per capita use to 100 gpd will produce a total demand, in 2010, of 100,000 gpd.

The present source of supply consists of five drilled wells and one dug well, in the valley of the South Fork, three miles west of Edinburg. Total well capacity is over 175,000 gpd. The present source of supply should be sufficient through 2010 and no storage is needed in the Taylorville Reservoir.

SUMMARY

TAYLORVILLE RESERVOIR

1. Taylorville will need an additional 3.5 mgd by 2010. The annual value of storage in the Taylorville Reservoir is $51,000.
2. Pana will have a need for 0.8 mgd. This need may be met more economically from ground water sources than from the Taylorville Reservoir.
3. The towns of Kincaid, Bulpitt, Tovey and Jeiseyville will have water demands of 0.5 mgd by 2010 which may be met more economically from ground water sources than from the Taylorville Reservoir.
4. The towns of Assumption, Moweaqua, Morrisonville, Stonington, Edinburg and Nokomis-Coalton presently have sources of water supply which are believed adequate to meet their needs through 2010.
5. Palmer, which has no municipal system, could obtain water most economically from Morrisonville.
6. A value of $1,500 per year would be obtained by releasing the 0.5 mgd, not required for future water supply needs, for dilution of the effluent from Taylorville's sewage treatment plant. This is the only pollution abatement benefit derived from the reservoir.

MACKINAW DELLS RESERVOIR

The proposed Mackinaw Dells Reservoir is located approximately 16 miles northwest of Bloomington at the confluence of the Mackinaw River and Panther Creek. Areas west and southwest of the reservoir site include those municipalities which could be supplied by the Illinois River or a rich groundwater belt. Groundwater in this area can be obtained in excess of 500 gpm per well. Aquifers in the remaining area, within 25 miles of the reservoir, can be expected to produce between 100 and 500 gpm per well.

Major surface water sources in the Mackinaw area include the Illinois, Mackinaw and Kappa Rivers. Panther, Money and Sugar Creeks are also important surface water sources.

Municipalities in the Mackinaw Dells area are generally small farm communities with populations under 1,000. Several cities, located on the Illinois River west of Mackinaw, have populations from twelve to twenty-five thousand. The smaller towns are capable of meeting their water supply needs from nearby groundwater sources because they contain very little if any industry. It is believed that towns with a population less than 1,000 would not transport and treat surface water when sufficient groundwater is available.

There are no large municipalities discharging sewage below the reservoir, therefore, water storage in the Mackinaw Dells Reservoir for low flow augmentation would not be needed for pollution abatement.

Records of the two State Agencies concerning present and future domestic and industrial water requirements, and the water availability in the area around Mackinaw Dells, indicate that only water supply

needs of Bloomington, Normal, Eureka and Towanda need be considered further.

Eureka

The city is a farm community of 2,400 people located on Highway 24, six miles northwest of the reservoir site. Eureka College and Libby McNeill and Libby Canning Company are located here. Eureka gets its water from a 100 million gallon artificial lake and five wells capable of supplying 1.7 mgd. The city's present water use is 400,000 gpd in the summer months and 175,000 gpd in the winter months. Libby McNeill and Libby, which operates only in the summer, is the city's largest water user.

The expected population of Eureka in 2010 is 4,400, and water use for that year is estimated to be 150 gpcd. Based on these values, Eureka is expected to need 0.66 mgd in fifty years. The present water supply facilities of the city will furnish 2.2 mgd in the year 2010.

Considering present supply and future needs, Eureka is not expected to have a need for water from this reservoir during the period considered.

Bloomington

Bloomington is an agricultural center of Illinois, and at the present time about a dozen industries are located there. The major industrial concerns are insurance, electric power, railroad, feed, dairy and hospital. The Illinois Agricultural Association, which employs 1,000 people, plans to move from Chicago to Bloomington in the near future.

The total industrial water use is now 630 million gallons per year. Existing industries will increase this use to about 1,100

million gallons per year by the year 2010. New industry is expected to increase this demand by another 945 million gallons per year. Domestic pumpage is expected to increase from 1,500 million gallons per year to 2,700 million gallons per year. The total water demand of Bloomington, in the year 2010, will be 4745 million gallons per year or 13 mgd.

The estimated population of the city in 2010 is 53,000. The total future water demand of 13 mgd will give a use of 250 gpcd.

Bloomington now receives water from Lake Bloomington, which has recently been raised six feet, and will provide 12.5 mgd in the year 2010, excluding sedimentation.

Normal

Normal is located on the northern edge of Bloomington. The Illinois Soldiers and Sailors Childrens School and the Illinois State Normal University are located there.

Normal has a population of 11,528 and a water demand of 805,000 gallons per day. The average use is 70 gallons per capita per day.

The city now obtains water from seven drilled wells which have a combined capacity of 2,360 gpm or 3.4 mgd. The estimated 2010 population and water use are 27,000 and 150 gpcd respectively. In 50 years Normal will require a water supply of 4.1 mgd.

It is believed that Normal will abandon its wells and obtain water from Bloomington in the future.

Towanda

The village is located five miles northeast of Normal on Highway 66. Towanda has a population of 400 and this is expected to increase to 1,000 by 2010. Village water use is expected to increase

from the present 21,500 gpd, to 150,000 gpd in the year 2010. Water is supplied to Towanda by Bloomington.

Alternate Sources

Assuming that Normal will obtain water from Bloomington in the future, the total demand of Bloomington, Normal, and Towanda would be 18.1 mgd in the year 2010. The present water supply of the area (Lake Bloomington) is expected to yield 12.5 mgd in fifty years. This would require that 5.6 mgd be obtained from a source other than Lake Bloomington.

Mackinaw Dells Reservoir

This Corps Project would be capable of supplying 50 mgd to the Bloomington area. A pipe line to transport 5.6 mgd water from Mackinaw Dells to the treatment plant at Lake Bloomington would have an annual cost of $185,000, including pumpage. The municipalities would also be expected to pay their proportionate share of the reservoir cost.

Alternate 1

An alternate reservoir could be constructed on Six Mile Creek which would supply an additional 2.2 mgd at an estimated annual cost of $104,000. The annual cost of transportation and pumpage from this reservoir to the treatment plant at Lake Bloomington would be $51,000. For utilization of this reservoir a total annual cost of $155,000 would be incurred.

Alternate 2

A reservoir could be built at this same site, on Six Mile Creek, which would supply 4.4 mgd at an estimated annual cost of

$132,000. Transportation and pumpage cost to Lake Bloomington in this case would be $51,000 per year. A total annual cost of $183,000 would be required for the use of this alternate reservoir.

Alternate 3

As a supplement to the alternates on Six Mile Creek an additional, low channel dam could be constructed on the Mackinaw River. This project would supply 1.7 mgd at an annual cost of $15,000 plus the additional cost of lifting this water to the treatment plant.

All yield figures given in the alternates above are those figures expected in 50 years.

A combination of the low channel dam on the Mackinaw River and the larger alternate on Six Mile Creek would supply 6.1 mgd at a total annual cost of $198,000. The combination of these alternates would be attractive in that a long range plan could be adopted by which construction is done as a water supply need arises, thereby reducing interest and operation charges.

As the cost of storage and transportation from an alternate source would be only $13,000 more than the cost of transportation only from the proposed Mackinaw Dells project, there would be no practical water supply benefit from the Mackinaw Dells project.

SUMMARY

MACKINAW DELLS RESERVOIR

1. Eureka has no need for water storage in this reservoir.
2. In 50 years Bloomington, Normal and Towanda will need 5.6 mgd in excess of the amount supplied by Lake Bloomington.
3. This 5.6 mgd could be secured from the Mackinaw Dells Reservoir. The annual cost of transporting this water to the point of use would be $185,000.
4. The most economical alternate source of water supply which will furnish 5.6 mgd has an annual cost of $198,000.
5. The cost of transporting water to Bloomington from the Mackinaw Dells Reservoir would be about the same as the cost of securing it from an alternate source. The reservoir water has no practical value for Bloomington, Normal and Towanda.
6. There is no economical justification for municipal and industrial water supply storage in the Mackinaw Dells Reservoir.
7. Water storage in the Mackinaw Dells Reservoir for low flow augmentation would not be needed for pollution abatement.

JUBILEE RESERVOIR

The most feasible site for a dam on Kickapoo Creek (Peoria County) is immediately downstream from Jubilee College State Park at mile 21.5. The Corps of Engineers concluded from its investigation that construction of a dam and reservoir at this site should not be included in the comprehensive plan for flood control and allied uses in the Illinois River Basin at this time. The Corps of Engineers requested the Public Health Service to investigate the justification of this reservoir based on water supply needs.

All municipalities within the influence of Jubilee Reservoir, including Peoria, use ground water.

Peoria recently constructed a supplemental water treatment plant to treat water from the Illinois River. The State agencies consider the quality of Illinois River water at Peoria to be satisfactory for municipal and industrial use at the present time. The flow in the Illinois River is more than adequate for any anticipated future needs in the Peoria area.

Water supply needs were checked with the Illinois Department of Public Health and the Illinois State Water Survey. From the information they furnished, it was determined that ground water supplies are adequate for all present and future needs except in the Peoria area where the Illinois River is available.

It is concluded from this investigation that there is no present or future need for municipal and industrial water supply from the Jubilee Reservoir, provided the Illinois River continues to be an acceptable water supply source.

There are no municipalities discharging sewage below the reservoir. Water storage in the Jubilee Reservoir for low flow augmentation would not be needed for pollution abatement.

LONDON MILLS RESERVOIR

The proposed dam and reservoir on Spoon River is located at mile 67.0 upstream from London Mills, Illinois. The dam would consist of a rolled-earth structure and a gravity concrete section with spillway controlled by tainter gates, with a maximum height and length of 86 and 3,700 feet, respectively. The reservoir capacity at pool elevation (585) is 487,000 acre-feet. A permanent conservation-sedimentation pool of 54,000 acre-feet with a surface area of 5,550 acres and an average depth of 9.7 feet would be provided for water supply and recreational purposes.

The largest cities within 25 miles of the dam and their respective populations are Galesburg (31,245); Canton (11,927); Monmouth (10,193); Bushnell (3,317); Abington (3,300); Farmington (2,651); Lewistown (2,630); Knoxville (2,209); Cuba (1,482), and Roseville (1,080).

Avon and Canton are the only municipalities in the area that use surface water for its supply. Other municipalities use well water, including Galesburg which has recently developed a well field in the Mississippi River bottoms.

The water supply needs of the above municipalities and all smaller communities within a 25 mile radius of the dam were reviewed with the State Department of Public Health and the State Water Survey. Based on information furnished by these two agencies, it is believed that there are no present or future water supply needs for water from the London Mills Reservoir.

There are no municipalities discharging sewage below the reservoir. Water storage in the London Mills Reservoir for low flow augmentation would not be needed for pollution abatement.

KENNY RESERVOIR

The proposed dam and reservoir on Salt Creek is located at mile 63.1 near Kenny, Illinois. The dam will be a rolled-earth structure with an ungated, chute spillway, with a maximum height and length of 90 and 3,800 feet, respectively. The reservoir would have a capacity at normal pool elevation (687) of 201,000 acre-feet. A permanent conservation-sedimentation pool of 34,200 acre-feet, with a surface area of 2,750 acres, would be provided for water supply and recreation purposes.

The Kenny Reservoir would be located between the proposed Mackinaw Dells and Oakley Reservoirs. Communities within 25 miles of the Kenney dam but closer to one of the other dams were not considered as possible users of Kenney Reservoir water. The largest of the municipalities considered and their respective populations are: Lincoln (14,362); Clinton (5,945); Le Roy (1,820); Farmer City (1,752); Mt. Pulaski (1,527), and Heyworth (1,072).

Most of the Kenny area lies over the pre-glacial Mahomet Valley which contains one of the most important water producing aquifers in Illinois. The remaining area has access to other good aquifers. Wells are used for all municipal water supplies in the area.

Water supply needs in the Kenney Reservoir area were checked with the Illinois Department of Public Health and the Illinois State Water Survey. From information furnished by these agencies it was determined that all present and future water supply needs could be satisfied by existing facilities or be developed locally from the excellent aquifers available.

There is no municipal or industrial water supply need from this reservoir.

Lincoln is the only major city which discharges sewage below the reservoir. Water storage in the Kenney Reservoir for low flow augmentation would not be needed for pollution abatement.

SUMMARY

ILLINOIS RIVER BASIN RESERVOIRS

A number of conclusions were evolved for each proposed reservoir. In this summation, no attempt will be made to repeat anything more than the most highly significant facts that bear directly upon the conclusions.

St. Mary Reservoir

1. Comprehensive studies were conducted on four municipalities: Macomb, Carthage, Blandinsville, and La Harpe. Only Macomb evidences any economic justification on the basis of water supply storage of 615 million gallons with an annual value of $46,900. The remaining municipalities present no economic justification.

2. None of the foregoing cities need low flow augmentation water storage for pollution abatement.

Oakley Reservoir

1. Decatur, with yearly average demands of 38 mgd, or a 45.5 mgd average over a critical, seven month period of maximum use and minimum runoff, is the only municipality that needs water for future demands projected to the year 2010.

2. The proposed Oakley Reservoir project would provide sufficient water, along with Decatur's municipally owned system, to meet peak demands until 1985. This project would have an annual value of $357,000. A project, at the Oakley Reservoir site, capable of supplying 26.2 mgd for the seven month critical period would furnish enough water, in conjunction with the municipally owned supply, until the year 2010. The annual value would total $630,000.

3. There is no water available for pollution abatement benefits as all will be needed for water supply purposes.

Taylorville Reservoir

1. The only municipality presenting economic justification is Taylorville, which by 2010 will require an additional water supply of 3.5 mgd.

2. The annual value for a 3.5 mgd supply from the Taylorville project

would be $51,000.

3. Annual value for pollution abatement would be $1,500.

Mackinaw Dells, Jubilee, London Mills, and Kenney Reservoirs

1. These reservoirs show no economic justification for water supply storage.

2. The projects are not required for pollution abatement purposes.

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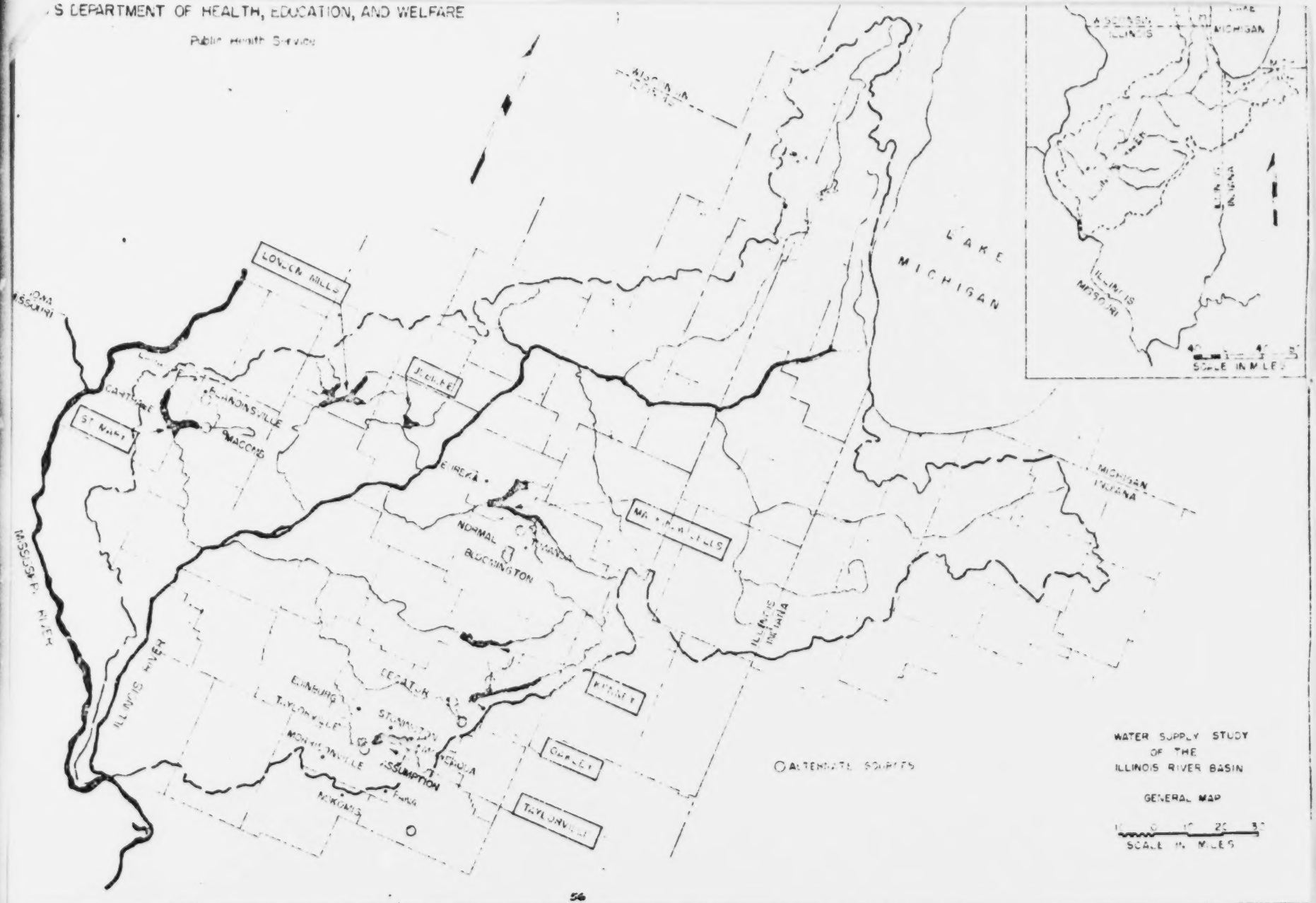
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